



Natural Heritage & Endangered Species Program

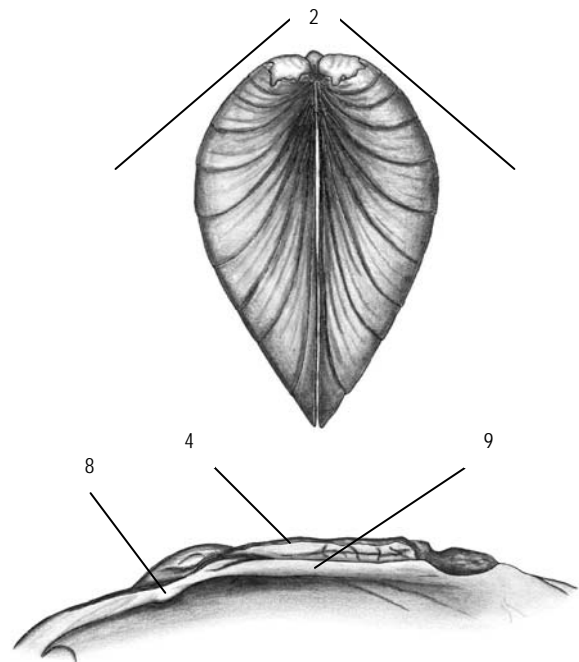
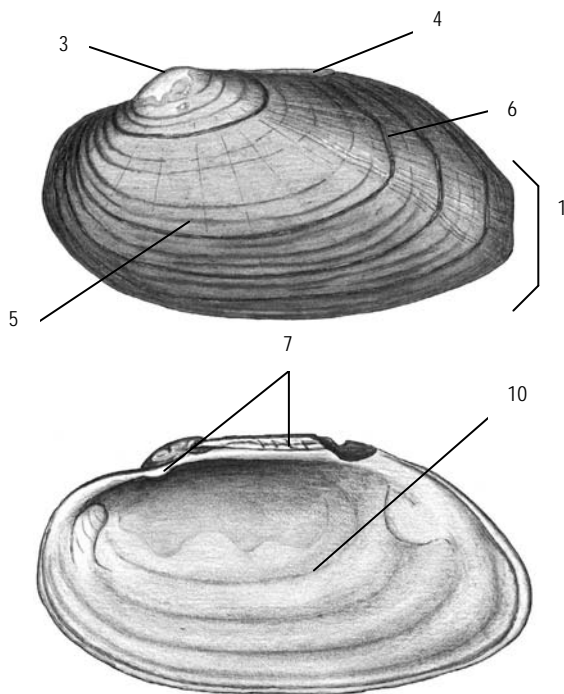
Massachusetts Division of Fisheries & Wildlife
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Creeper *Strophitus undulatus*

State Status: **Species of Special Concern**
Federal Status: None

Description: The creeper is a small freshwater mussel that rarely exceeds three inches (75mm) in length. The shape is subovate to subtrapezoidal and usually has a blunt posterior end (1). The shells are slightly inflated (2), thin, and fragile. Beaks (3) are barely elevated above the hinge line (4). Sculpturing on the beak is usually coarse and prominent, but this feature is often only evident in animals with little shell erosion. The surface of the shell is often rough due to prominent growth lines. The periostracum (5) may be yellow or greenish-brown in young animals, and brown or black in older animals. Fine green shell rays may be evident toward the posterior slope (6), particularly in young animals or light-colored adults. Hinge teeth (7) are almost entirely absent—pseudocardinal teeth (8) appear as an indistinct swollen area of the nacre below the beak. Lateral teeth (9) are absent. The nacre (10) is white or bluish-white, and it is dull-yellow or greenish toward the beak cavity. Feet may be a very pale orange color but this trait is variable.

Similar Species in Massachusetts: Shells (dead animals) are usually easy to distinguish because they lack hinge teeth and have a distinct color pattern on the nacre. However, these features cannot be used when identifying live animals. The novice will often have difficulty discerning between live animals of the creeper, eastern elliptio, brook floater, dwarf wedgemussel, triangle floater, alewife floater, and eastern floater. Greatest difficulty arises when trying to identify juveniles, animals with excessive shell erosion, or animals whose periostracum is darkly stained or covered with algae. A common error is to confuse the creeper with young eastern elliptio, which unlike the creeper have very strong, thick shells. An expert should be consulted to identify the species because it is listed as a Species of Special Concern in Massachusetts and because it can be confused with three other state or federally protected species (brook floater, triangle floater, and dwarf wedgemussel).



Illustrations by Ethan Nedeau

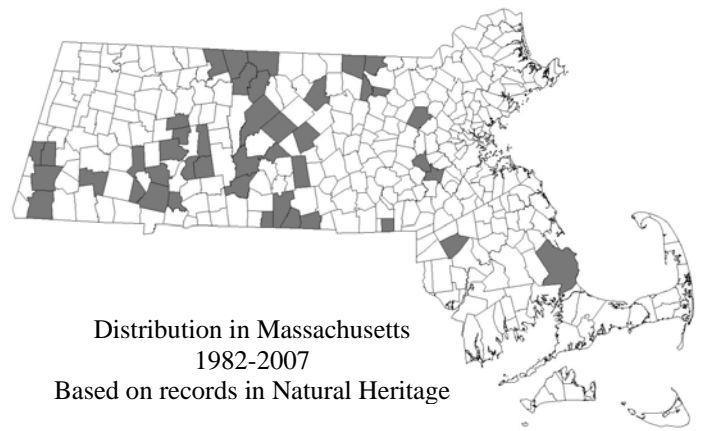
Text contributed by Ethan Nedeau, December 2007, Creeper Fact Sheet.

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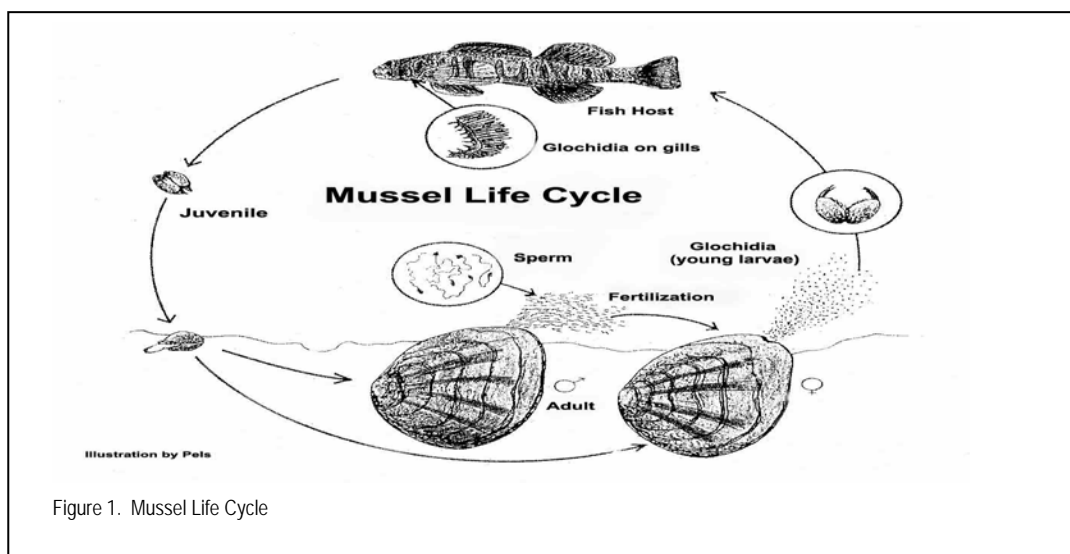
Range: The creeper is widely distributed in North America. It occurs in most Atlantic coastal drainages from Florida to Newfoundland and occurs west of the Appalachian Mountains to Texas and Saskatchewan (including the St. Lawrence River system, Great Lakes basin, and the Ohio and Mississippi River systems). In Massachusetts, the creeper is present in 13 sub basins located mostly in the western two-thirds of the state.

Habitat: In northeastern North America, the creeper inhabits small to large rivers. Preferred habitats include low-gradient river reaches with sand and gravel substrates and low to moderate water velocities, although they can occur within a broader range of habitat conditions (Nedeau *et al.* 2000). While the creeper has not been reported from lakes in the Northeast, they often inhabit small impoundments of run-of-river dams that retain some amount of flow. Streams and rivers that are productive, cool to warm-water environments with diverse fish assemblages are most likely to support the species. Creepers are generally sparse or absent in headwater streams and high-gradient river reaches. They occur most frequently with eastern elliptio, triangle floater, dwarf wedgemussel, and brook floater but have a far broader distribution than the latter two species.

Biology: Freshwater mussels are essentially sedentary filter feeders that spend most of their lives anchored to the bottoms of rivers, streams, lakes, and ponds by their muscular foot. Gills circulate water through their shells via incurrent and excurrent openings, siphoning nutrients to be absorbed by the digestive system. This filtering process is also critical for successful reproduction (Figure 1). Like all freshwater mussels, larvae (called glochidia) of the creeper must attach to the gills or fins of a vertebrate host (mainly fish) to develop into juveniles (for a review, see Nedeau *et al.* 2000). This parasitic phase is the only period during



which mussels can disperse long distances. Fertilization occurs in the summer and glochidia are released the following spring. Studies have identified many vertebrate hosts, including a suite of species common in cool to warm-water streams in Massachusetts such as largemouth bass, fallfish, longnose dace, blacknose dace, common shiner, golden shiner, slimy sculpin, bluegill, rock bass, and even two-lined salamanders and red-spotted newts (Nedeau *et al.* 2000, Gray *et al.* 2002). Gray *et al.* (2002) found a low degree of host specificity for the creeper—its glochidia successfully metamorphosed into juveniles on 15 of the 22 species examined. Because the creeper will parasitize such a broad range of native and non-native fish species in Massachusetts, its viability may be less reliant on specific fish as compared to other mussel species, such as the dwarf wedgemussel, which is highly host-specific. Lefevre and Curtis (1911) found that glochidia of the creeper could transform into juveniles without a fish host, a trait that is rare among freshwater mussels. This observation has not been confirmed.



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Population Status in Massachusetts: As of October 2007, there were 58 occurrences of the creeper in 13 sub basins and 42 towns in Massachusetts. Of these 58 occurrences, 38 were represented by live animals and 20 by spent shells only (dead shell remnants). Only 12 of the 38 live occurrences were comprised of 10 or more individuals. Although the creeper is widely distributed in Massachusetts, it is never abundant and the long-term viability of low-density populations is poorly understood. Therefore, the creeper is listed as a Species of Special Concern in Massachusetts pursuant to the Massachusetts Endangered Species Act (M.G.L. c.131A) and its implementing regulations (321 CMR 10.00). Maine lists the creeper as a Species of Special Concern for similar reasons as Massachusetts (Nedea *et al.* 2000), and there is concern for the species in Rhode Island even though it receives no formal protection (Raithel and Hartenstine 2006).

Threats: Because creepers are essentially sedentary filter feeders, they are unable to flee from degraded environments and are vulnerable to the anthropogenic alterations of waterways. Some of the many threats to the creeper and its habitat in Massachusetts include: nutrient enrichment, sedimentation, point-source pollution, alteration of natural flow regimes, water withdrawal, encroachment of river corridors by development, non-native and invasive species, habitat fragmentation caused by dams and road-stream crossings, and a legacy of land use that has greatly altered the natural dynamics of river corridors. In addition, the long-term effects of regional or global problems such as acidic precipitation, mercury, and climate change are considered severe but little empirical data relates these stressors to mussel populations. As local populations of creepers decline and/or become extirpated in response to these threats, dispersal distances between populations increase, weakening overall reproductive success and ultimately genetic diversity (Vaughn 1993).

Conservation & Management Recommendations:

Discovery and protection of viable mussel populations is essential for the long-term conservation of freshwater mussels. Currently, much of the available mussel occurrence data are the result of limited presence/absence surveys conducted at road crossings or other easily accessed points of entry. In addition, regulatory protection under MESA only applies to rare species occurrences that are less than twenty-five years old. Surveys are critically needed to monitor known populations, evaluate habitat, locate new populations, and assess population viability at various spatial scales (e.g., river, watershed, state) so that conservation and restoration efforts, as well as regulatory protection, can be effectively targeted. The NHESP has produced the *Freshwater Mussel Habitat Assessment and Survey Guidelines* and maintains a list of experts qualified to conduct surveys. Other conservation and management

recommendations include:

- Maintain naturally variable river flow and limit water withdrawals
- Identify, mitigate, or eliminate sources of pollution to rivers
- Identify dispersal barriers (e.g., dams, impassable culverts) for host fish, especially those that fragment the species range within a river or watershed, and seek options to improve fish passage or remove the barrier
- Maintain adequate vegetated riparian buffers
- Protect or acquire land at high priority sites

Further Reading

- Gray, E.V.N., B.A. Lellis, J.C. Cole, and C.S. Johnson. 2002. Host Identification for *Strophitus undulatus* (Bivalvia: Unionidae), the Creeper, in the Upper Susquehanna River Basin, Pennsylvania. *The American Midland Naturalist* 147(1): 153-161.
- Lefevre, G., and W.C. Curtis. 1911. Metamorphosis without parasitism in the Unionidae. *Science* 33: 863-865.
- Nedea, E.J., and J. Victoria. 2003. *A Field Guide to the Freshwater Mussels of Connecticut*. Connecticut Department of Environmental Protection, Hartford, CT.
- Nedea, E.J., M.A. McCollough, and B.I. Swartz. 2000. *The Freshwater Mussels of Maine*. Maine Department of Inland Fisheries and Wildlife, Augusta, Maine.
- Raithel, C.J., and R.H. Hartenstine. 2006. The Status of Freshwater Mussels in Rhode Island. *Northeastern Naturalist* 13(1): 103-116.
- Vaughn, C. 1993. Can biogeographic models be used to predict the persistence of mussel populations in rivers? pp.117-122 in K.S Cummings, A.C. Buchanan and L.M. Koch (eds.), *Conservation and Management of Freshwater Mussels: proceedings of a UMRCC symposium, 12-14 October 1992, St. Louis, Missouri*. Upper Mississippi River Cons. Com., Rock Island, Illinois. 189 pp.

Updated: 12/01/07

Text contributed by Ethan Nedea, December 2007, Creeper Fact Sheet.

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